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INTERSTATE AIR POLLUTION STUDY. PHASE
II PROJECT REPORT. 1. INTRODUCTION

N. G. Edmisten, et al

Robert A. Taft Sanitary Engineering Center
Cincinnati, Ohio

May 1966

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INTERSTATE AIR POLLUTION STUDY

**BI-STATE DEVELOPMENT
AGENCY**

**ST. LOUIS DEPARTMENT OF
HEALTH AND HOSPITALS**

**ST. LOUIS - DIVISION OF
AIR POLLUTION CONTROL**

**EAST ST. LOUIS - AIR
POLLUTION CONTROL
COMMISSION**

**ST. LOUIS COUNTY
HEALTH DEPARTMENT**

**EAST SIDE HEALTH
DISTRICT**

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METROPOLITAN ST. LOUIS**

**ILLINOIS AIR POLLUTION
CONTROL BOARD**

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PUBLIC HEALTH SERVICE**

PHASE II PROJECT REPORT

I. INTRODUCTION

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**INTERSTATE AIR POLLUTION STUDY
PHASE II PROJECT REPORT**

I. INTRODUCTION

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Cincinnati, Ohio

May 1966

FOREWORD

The Interstate Air Pollution Study was divided into two phases. Phase I, a general study of the overall air pollution problems in the St. Louis - East St. Louis Metropolitan area, was conducted to determine specific activities that would require further study in Phase II of the project. The effort was divided into two phases to provide a logical stopping point in the event that interest and resources for proceeding further might not materialize. The necessary impetus did continue, however, and the Phase II operation was also completed.

The Phase I operation resulted in a detailed report, designed primarily for use of the Executive Committee members and their agencies in making decisions concerning the Phase II project operation. A Phase I summary report was also prepared; it received wide distribution.

Numerous papers, brochures, and reports were prepared during Phase II operation, as were some 18 Memorandums of Information and Instruction concerning the project. All of these documents were drawn upon in the preparation of the Phase II project report. The Phase II project report consists of eight separate volumes under the following titles:

- I. Introduction
- II. Air Pollutant Emission Inventory
- III. Air Quality Measurements
- IV. Odors - Results of Surveys
- V. Meteorology and Topography
- VI. Effects of Air Pollution
- VII. Opinion Surveys and Air Quality Statistical Relationships
- VIII. Proposal for an Air Resource Management Program.

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I. INTRODUCTION

AIR POLLUTION DEFINED

In a precise chemical sense there is no "pure" air. Chemically speaking, purity refers to a single element or compound, and the presence of any other element or compound in lesser amounts constitutes an impurity. Air, therefore, by being a mixture of several gaseous elements and compounds, is not pure. It is approximately 80 percent nitrogen and 20 percent oxygen with small quantities of argon and carbon dioxide and trace quantities of the inert gases such as helium and neon. As a basis for a definition of air pollution, therefore, one cannot use a chemical definition of purity, but must use pure air in the sense that it is the best air for a particular purpose or purposes.

The definition of air pollution is not based primarily on absence or the presence of impurities, but more on the quantity and characteristics of impurities. Air is said to be polluted when the effects it causes or may be expected to cause are damaging or detrimental to the use or users of that air. Although all air pollution does not result from man's activities, control of air pollution is a human activity.

To control air pollutants to the extent that they do not cause detrimental effects, definitions other than those based on physical and biological criteria are necessary. These are legal definitions of air pollution. The legal definition used in this report is:

"Air Pollution" means the presence in the ambient air of one or more air contaminants, naturally occurring or man made, in quantities, of characteristics, and of a duration that are, or may tend to be, injurious to human, plant, or animal life or health, or to property, or that interfere with the comfortable enjoyment of life or use of property.

HISTORICAL BACKGROUND

On February 16, 1764, when August Chouteau, at the direction of Pierre Laclède Liguist, began to build a shed in which to store provisions and tools just in front of the spot where the Gateway Arch now stands, the choice of that location was not by chance alone. Liguist was a far-sighted man; this site was to become the City of St. Louis. The Missouri and Mississippi Rivers would not only afford Liguist the transportation needed for the establishment of a successful trading post, but they would also afford the transportation and water necessary

for the building of a great city. With the vast trade established by Liguist, it was axiomatic that manufacturing would soon follow. With the discovery of iron, coal, and other natural resources nearby, manufacturing grew and from it today's metropolis resulted.

Black smoke at one time epitomized industrial activity and prosperity. In St. Louis this symbol was enhanced by the proximity of the vast bituminous coal fields across the Mississippi River in Illinois. This plentiful supply of low-cost fuel contributed greatly to the city's industrial growth. Unfortunately, this coal ranks high in volatile products, ash, and sulfur content and is difficult to burn smokelessly. Evidence of the city's smoke pall was reported in the following incident:

"An exciting event in pioneer days of aviation took place on Columbus Day, 1910, when Captain Baldwin piloted his little biplane, The Red Devil, under the middle span of Eads Bridge. St. Louisians stood on the levee and watched, their hearts in their mouths, and almost missed the sight, as the city's smoke was so thick they could hardly see the bridge."¹

Smoke as a symbol of prosperity soon lost its glamour as people began to recognize its undesirable effects. The effects of this pollutant were manifested in many ways, such as laundry bills, redecorating costs, deterioration of sheet metal and other exterior surfaces, loss of merchandise on store shelves, and the extra cost of artificial lighting. The Union Electric Company, referring to the period prior to 1940, estimated the cost of additional lighting alone at \$75,000 per year.

A sensitive index of air pollution was found in flowering plants, shrubs, and trees. The Missouri Botanical Gardens reported varieties such as begonias, cinerarias, tropical water lilies, and fuchsias completely defoliated by single, severe smoke episodes of less than a 24-hour duration. Latent effects showed up over longer periods of exposure in abnormal browning and dropping of leaves, and drooping and discoloration of flowers. In fact, planting of certain sensitive species, especially evergreens, in the downtown area became unthinkable.

The overall effect on human health has never been fully evaluated, but the eye, ear, nose, and throat specialists of the city reported that prolonged and repeated exposure to the soot-laden air of St. Louis caused serious and permanent damage to the delicate membranes of the nose, sinuses, and lungs. Such injuries rendered the membranes more susceptible to infection, with resultant increases in colds, sore throat, sinus infection, influenza, laryngitis, bronchitis, pneumonia, etc.² Some practitioners coined the term "St. Louis throat" to describe certain symptoms.

The first antismoke court action in St. Louis, and possibly the first in the United States, was filed in 1863. It was claimed that smoke from a shed on a neighbor's property "escaped into and on the premise of plaintiff, rendering his house almost untenable and otherwise injuring same." The Missouri Supreme Court stated that the plaintiff was injured by the defendant's negligent or willful misuse of his property. The plaintiff was awarded \$50.00 in damages.

In 1893 St. Louis passed its first antismoke ordinance, making it a violation to emit dense black or thick gray smoke into the atmosphere. In 1897 the Missouri State Supreme Court ruled this ordinance void because, in the Court's opinion, it exceeded the powers of the City under its charter.

In the next 44 years, St. Louis passed at least eight antismoke ordinances in efforts to improve the atmosphere, but no more than a handful of men were ever assigned to enforce them. In 1924, for example, the smoke pollution control staff consisted of a chief and four inspectors for a city of 800,000 people.

During this period, several attempts were also made, principally through the Citizens Smoke Abatement League, to teach the citizens of St. Louis proper coal-firing techniques. In 1926 this group raised \$200,000 by private subscriptions for this purpose. The smoke nuisance became progressively worse, however. Other major cities showed the same general trend; they, too, attempted to educate and legislate against excessive smoke.³ The depression of the 1930's called for priority action on many fronts. As a result, hope for smoke abatement dropped to an all time low.

Under these circumstances, and after the peak of the depression, St. Louis pioneered a new movement to rid the metropolitan area of the persistent sooty pall. This active phase of air pollution control work began on February 11, 1937, when the Board of Aldermen passed an ordinance creating the Division of Smoke Regulation in the Department of Public Safety. This action paved the way for a new and different type of antismoke regulation - the preventive type.⁴ The ordinance specified that all coal of less than 2-inch maximum size, sold in the city, had to be washed to an ash content of not over 12 percent on a dry basis. This was passed, not alone on the basis of eliminating smoke, but primarily on the basis of improving firing conditions by use of underfeed stoker units. In December 1939 Mayor Bernard F. Dickmann appointed the St. Louis Committee on Elimination of Smoke. This committee submitted a report to the Mayor in February of 1940. The committee had concluded that smoke would never be controlled so long as the unrestricted use of high volatile coal was allowed in the city and recommended that this type of coal be mechanically fed, and that hand-fired units be required to use a smokeless fuel (less than 23 percent volatile matter on a dry basis.) These recommendations became part of an ordinance about 2 months after the report was

submitted to the Mayor. This ordinance changed the fuel-use habits of the entire city, but not before its constitutionality was tested and upheld in the Missouri State Supreme Court.³

The success in prevention of smoke was spectacular. The Weather Bureau, U. S. Department of Commerce, made routine hourly smoke observations from its downtown St. Louis station at 12th and Market Streets. The official records of these observations substantiate the great improvement in smoke reduction.

The success against smoke by the Division of Smoke Regulation led to recognition of other air pollution problems associated with materials not resulting from the combustion of fuel or refuse. The Board of Aldermen in April 1948 passed an air pollution control ordinance making it unlawful to discharge into the City's atmosphere any fumes, gases, odors, dust, dirt, grime, vapors, ashes, or cinders in such concentrations as to be detrimental or endanger the health, comfort, or safety of the public. For the first time a public health preamble was added as partial justification for control. The administration of the duties outlined in this ordinance was placed under the jurisdiction of the Health Commissioner. In the Health Division, the work was assigned to the Industrial Hygiene Section, because of related knowledge and instrumentation already available in that Section.

Air pollution control activities in St. Louis remained a function of these two agencies until 1961. In January of that year the St. Louis Board of Aldermen passed an ordinance consolidating all air pollution activities into the Division of Air Pollution Control - part of the Department of Public Safety. This transfer of activities was consummated, and this entire function is presently (1965) in that Department.

Considerable air quality measurement work was done in the 1930's and 40's to evaluate the atmospheric pollution in and around St. Louis by city agencies and by other interested organizations. One such study was conducted by the Air Hygiene Foundation of America, Inc. (now Industrial Hygiene Foundation, Pittsburgh, Pennsylvania), in the period from October 10, 1936, to April 25, 1937.⁵ The work consisted of measurement of temperature, wind direction, relative humidity, and volatile sulfur compounds in the atmosphere. The work in St. Louis was done by one man who used an automobile supplied with the necessary equipment to make all the determinations and observations in the field. The sodium hydroxide absorption, iodine titration method of Smith and Fries was used. The maximum winter (October-April) concentration found was 2.27 parts per million (ppm), measured in the Brooklyn, Illinois, area. The winter season average for the entire area was 0.147 ppm and for the central district (5-mile radius), 0.261 ppm. The maximum summer (April-October) concentration was 1.08 ppm at the City-County Building on Grant Street in East St. Louis. The summer average over the entire area was 0.06 ppm, with 0.11 ppm in the central district.

A followup study was done in 1950 to compare the conditions existing then with the conditions encountered in the 1936-37 survey. The winter phase of the 1950 survey was conducted on 27 different days between February 23 and March 31. The summer phase was conducted on 21 different days between June 5 and July 29. Samples were collected at a total of 14 stations in this study with the locations being essentially the same as in the 1936-37 study. Again the sodium hydroxide absorption, iodine titration method of Smith and Fries was used to determine the concentrations of the volatile sulfur compounds.

The reduction in atmospheric sulfur dioxide concentrations from 1936-37 to 1950 was substantial with an average reduction of 73 percent in the summer and 83 percent in the winter.⁶ This significant reduction in sulfur dioxide and major reduction in smoke can be accounted for by the following factors:

1. Use of low-volatile low-sulfur coal in hand-fired units.
2. Use of washed, solid, stoker fuels having low sulfur content.
3. Changeover from coal to a fuel of lesser sulfur content
(influenced by 1 and 2)
4. Dieselizeation of railroad locomotives.

A study was made during August and September of 1949 by the St. Louis City Health Department to evaluate the ragweed pollen problem. Six pollen collection stations were established over an area 1¼ by 10 miles in the metropolitan area. Sampling procedures declared standard by the American Academy of Allergy were followed. The study report concluded that the average allergic person would experience 28 to 29 days of ragweed hayfever symptoms per year.⁷ An estimated 5 percent of the Interstate Air Pollution Study Area population suffer from hayfever, which is high on the list of public health problems.

In Illinois as early as 1949, attempts were made to enact legislation to create a state legislative study commission on air pollution. These attempts were unsuccessful. Although the Illinois Department of Public Health had no statutory support for air pollution activities until 12 years later, it kept abreast of the subject and participated in air pollution studies and investigations. These air pollution matters were treated under the general statutory authority of the Department or were definite parts of industrial hygiene programs or leadership programs directed toward local agencies. During this period, the Department published two major reports. "Something in the Air" was a summary of air pollution problems in Illinois with specific recommendations for dealing with them. The "BiState Study of Air Pollution in the Chicago Metropolitan Area" was the result of a cooperative effort by the Department with the Indiana State Board of Health and the Public Health Service. The Chicago study was directed primarily toward estimating emissions of air contaminants in the area.

In 1961 the Illinois General Assembly strengthened the authority of cities and counties by providing them with specific authority to regulate land uses and

building equipment that emit air contaminants. Additional legislation created a State Air Pollution Control Board within the Department of Public Health to serve the northeastern Illinois metropolitan area in an advisory capacity. The Board was appointed by the Governor and functioned in an advisory capacity, but had no authority for controlling air pollution. A third law in 1961 created the Southwestern Illinois Area Study Commission for the purpose of undertaking long-range planning for the metropolitan area centering around East St. Louis. An air pollution subcommittee of the Commission reported on the impact of air pollution in the area and made specific recommendations for control by a State agency. A bill to create a state air pollution control agency with restricted regulatory powers was vetoed as ineffective by the Governor during this same year.

In 1963 the Illinois General Assembly enacted the present Illinois Air Pollution Control Act. The Act created the Illinois Air Pollution Control Board as an independent agency responsible for the prevention and abatement of air pollution throughout the State. The Act further provided that the basic personnel for fulfilling the provisions of the Act will be personnel of the Department of Public Health. An appropriation of \$50,000 for a period of 2 years was made.

Since its appointment in October 1963, the Illinois Air Pollution Control Board has initiated action in a number of areas dealing with air pollution control. Interstate legislation with Indiana has been included in action initiated.

In 1965 the Missouri State Legislature enacted the Missouri Air Conservation Law. The Commission provided for by the law had been appointed but a staff had not been employed by the end of 1965.

INTERSTATE AIR POLLUTION STUDY

Origin of Study

The Interstate Air Pollution Study, St. Louis - East St. Louis Metropolitan Area, has been a cooperative project between the Technical Assistance Branch, Division of Air Pollution, Public Health Service, U. S. Department of Health, Education, and Welfare (an agency of the Federal Government) and state and local agencies. It was undertaken as a cooperative study of air pollution in the St. Louis - East St. Louis Metropolitan Area with the broad objectives of (1) assisting the two States and several local agencies to strengthen and coordinate their air pollution activities and control programs and (2) augmenting existing knowledge on the nature and distribution of air pollution and factors affecting prevention or control.

The Interstate Air Pollution Study was undertaken as a result of two requests from local agencies to the Public Health Service, Division of Air Pollution.

These requests were submitted almost simultaneously but independently. One originated from the late Mr. James H. Carter, Commissioner of Air Pollution for the City of St. Louis, Missouri. The other was initiated by the Reverend W. R. Warner, who was at that time Chairman of the East St. Louis Mayor's Air Pollution Committee, for the City of East St. Louis, Illinois. Mr. Carter requested aid in studying and solving odor problems. Reverend Warner requested assistance in drafting an air pollution ordinance for the City of East St. Louis.

A preliminary investigation indicated that the air pollution problem in the St. Louis metropolitan area was of such nature that the mere drafting of an ordinance for one city, or the study of odor problems in another city would not solve the air pollution problem of the two-state metropolitan area.

At meetings of Technical Assistant Branch representatives with some of the local agencies from both states in the early spring of 1962, it was determined that there was local interest in doing an extensive cooperative survey.

Organization

In the early fall of 1962 a group of representatives from the two states and local metropolitan area agencies met and drafted what is now the Interstate Air Pollution Study project agreement. The Study project was designed for two parts. The first, Phase I, was started on January 1, 1963, and lasted for 6 months, to June 30 of that year. The purpose of Phase I was to make an appraisal of air pollution in the St. Louis - East St. Louis Metropolitan Area and prepare a report that would indicate areas of major importance that were to be studied in more detail during Phase II. Phase II was to begin at the end of Phase I and last for an additional year. The data gathered during the two phases would then be studied and recommendations made for an air resource management program.

The Interstate Air Pollutin Study was dependent on the cooperation of several agencies representing several separate political bodies and independent interests; therefore, complete understanding and agreement concerning direction and purpose had to be established. This unity was assured in two ways. Cooperative project agreements were drawn up for each of the two phases and signed by the cooperating agencies. The Phase I Project Agreement was signed on January 17, 1963, by representatives from:

St. Louis Department of Public Safety, Division of
Air Pollution Control

East St. Louis

St. Louis County Health Department

East Side Health District

Missouri Division of Health
Illinois Department of Public Health
Bi-State Development Agency
Metropolitan Chamber of Commerce
U. S. Public Health Service

The Phase II Project Agreement was signed on May 14, 1964, by all of the above agencies and two additional agencies. They were:

St. Louis Health Division
State of Illinois Air Pollution Control Board

The core of the Project operation was an executive committee composed of representatives from the agencies that signed the Cooperative Project Agreement. The Public Health Service representative served as Project Director and Chairman of the Executive Committee until the Spring of 1965 when a local agency representative assumed this function. The Executive Committee was the policy-making body of the project.

The Division of Air Pollution, Technical Assistance Branch, furnished the full-time staff, which consisted of an average of five technical persons and one secretary. The number was flexible, however, and fluctuated as needs arose or items of the Project were completed. In addition the Technical Assistance Branch furnished office space and equipment. The cooperating agencies furnished additional personnel, laboratory services, and other services.

The final goal of the Project was to develop an air resource management program plan to recommend to the citizens of the two-state metropolitan area.

Study Area

The Study area consisted of six counties plus the City of St. Louis. They were St. Louis, St. Charles, and Jefferson Counties in Missouri and St. Clair, Madison, and Monroe Counties in Illinois. This is the area covered by the Bi-State Development Agency. It consists of the St. Louis Standard Metropolitan Statistical Area plus Monroe County, which has an area of 380 square miles and a population of 15,507. The total Standard Metropolitan Statistical Area population in 1960 was 2,060,000. Approximately 95 percent of the population and most of the industrial area are concentrated in a 400-square-mile, centrally located, urbanized area. Table 1 and the Study area population map, Figure 1, show the Study area population distribution characteristics.

The topography of the Study area is gently rolling, with elevations from 480 feet above sea level in the downtown St. Louis City area to 550 feet at

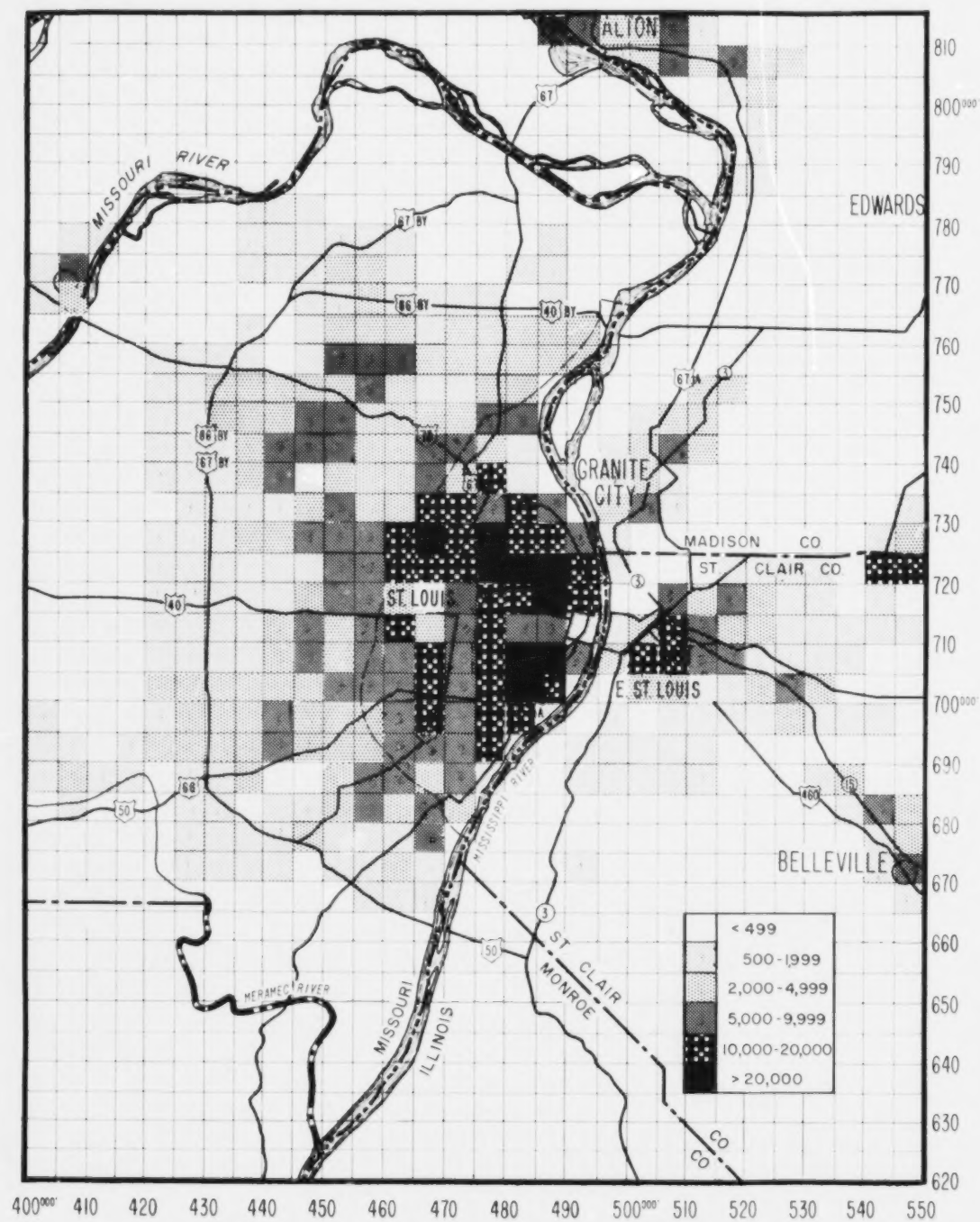


Figure 1. Study area population by 5,000-foot grid squares - 1960 census.

Table 1. STUDY AREA POPULATION DISTRIBUTION

City or county	Area, square miles	Population ^a
St. Louis City	61	747,127
St. Louis County	497	703,532
St. Charles County	561	52,970
Jefferson County	667	66,377
St. Clair County	670	262,509
Madison County	731	224,689
Monroe County	380	15,507
Total	3,567	2,062,711

^a 1960 census.

Lambert Field 12 miles away, with a slight ridge rising to 600 feet in between. A flat area, known as the American Bottoms, approximately 10 miles wide in the Illinois portion of the Study area, is flanked to the east by a crescent-shaped bluff rising to an average of 640 feet above sea level. The elevation of the Mississippi River is about 400 feet above sea level. The area is generally free of major land surface features that would strongly influence airflow characteristics over the area.

Operation

In order to accomplish the Study purpose, the following activities, quoted from the project agreement, were to be undertaken during Phase I.

- "1. Assemble lists of air pollution complaints received by air pollution departments, health departments, and other branches of local government.
- ②. Conduct a preliminary inventory of air pollution sources and their locations. Locate and list major single sources, groups of sources and determine in a general way the types of problems and trends affecting those problems.
- ③. Indicate the growth trends ^{in the state and its SMSA's} of the area, in regard to population, economics, industry, transportation and power.
- ④. Compile and put in usable form existing information on air pollution such as meteorological information, previous air quality information, previous sociological, meteorological and economic studies that have a bearing on air pollution.
- ⑤. Conduct an odor survey directed primarily toward defining more precisely the problems at hand, and developing a methodology for their eventual solution. It will be started by the use of scentometers and by an observer copps of people such as high school students.

- (6) Collect and make an evaluation of local ordinances, state laws and enabling acts pertaining to air pollution and prepare guidelines for an ordinance for East St. Louis and for other communities desiring same.
7. Survey existing programs in air pollution including consideration of their relation to planning and zoning. It is anticipated that this survey would lead to an activity in Phase II of the program which would be of interest to the Bi-State Development Agency, the PHS--Division of Environmental Engineering and Food Protection, and the PHS--Division of Air Pollution.] ent
- (8) Make a survey of official and industry opinion concerning air pollution. This would serve as a means of assessing the air pollution problem as viewed by industry, city, county and village officials and for determining the problems that face them as well as their attitudes and desires concerning changes.
9. Considerable work has been done in the Greater St. Louis area on the effects of air pollution on vegetation. Certain additional work and summarization of past work is desirable. This will be done under the guidance of the PHS--DAP Laboratory of Medical and Biological Sciences--Agricultural Section in cooperation with state and local governmental agencies. It will have as its objective a continuing vegetation damage surveillance activity.
10. A public opinion survey will be made under the general supervision of Public Health Service consultants. It will be directed toward determining without bias the opinions and desires of the citizens. In addition to its value to the state ~~St. Louis areas~~, the information obtained will assist materially in developing Phase II of this project and long range community programs in other areas.
- (11) Determine air quality within the limitations of resources that can be made available. Planning maps for sampling station networks will be prepared for each of the types of air pollutants to be measured. These will show the number and distribution of stations needed to give data of a certain probable reliability. The probable location and numbers of available equipment will also be indicated on these maps. This will assist the advisory and executive committees to understand and contribute to this program phase."

All of the above items were attempted except for the industry opinion part of item 8. During the course of the Study participation by industry in the industrial emission inventory and other parts of the Study gave adequate information in this area. As a result, this item was deleted.

In the Phase II Project Agreement, 17 items were listed under three classes of priority. Seven items that the Executive Committee felt were essential to reach project goals were given first priority. Seven items were listed as second priority; these items were felt to not be of primary importance in reaching the project goal but were of interest and desirable, provided there was money and

manpower available to carry them out. Third priority items were primarily research dependent on action of the Federal Government, and would be completed only if money and manpower were available.

First priority - items essential to reaching project goals

- "1. Develop an air resource management program plan for the Project area with a time schedule for implementation and a plan for financing the program.
2. The air quality measurement program developed and operated during Phase I of the Project will continue in operation and will gradually be redesigned and modified for local agencies to operate or finance for central operation. It will function as a continuing activity providing a sound air quality basis for an air resource management program. Cooperate with the Continuous Air Monitoring Program (CAMP) of the Laboratory of Engineering and Physical Sciences Branch of the Division of Air Pollution to assure this program's success and full usefulness to other parts of the air resource management program being developed.
3. A detailed emission inventory will be made. This will build upon the work done in Phase I of the Project and will serve the needs of an air resource management program and research work testing the mathematical diffusion models. It will be coordinated with planning and zoning activities, and will help develop an air-use data bank. The emission inventory will be made with the cooperation and help of the Industrial Waste Council. It will relate emissions to the map grid system put into operation during Phase I of the Project.
4. A complaint-recording system will be placed in operation. All cooperating agencies, both state and local, will record complaints in a uniform manner, using the map grid system. Copies of these records, if their numbers warrant, will be handled by automatic data processing through a program developed by the Project staff. The resulting reports and data, including maps, will be made available to interested agencies and individuals in the area periodically. This program activity will become the responsibility of local agencies at the end of this Project.
5. Establish a subcommittee on ambient air quality standards within the Project Executive Committee. The subcommittee will have the responsibility for locating and bringing together the technical competence and group interests needed to determine ambient air quality standards. If these subcommittee activities should indicate that insufficient information is available on which to establish standards, the subcommittee is expected to indicate studies which should be made and outline a plan which will lead to the formulation of standards in a reasonable length of time. The Executive Committee would expect to make recommendations based on the subcommittee's report. However, it recognizes that it does not have authority to establish standards and, therefore, if agencies with this authority enter this activity, the Project will assist them in all ways possible.

6. Establish a subcommittee of the Executive Committee on ordinances, rules and regulations. This subcommittee would build upon the activities started during Phase I of the Project with the City of East St. Louis and St. Louis County. The Executive Committee would review suggested ordinance provisions prepared by the subcommittee and, if satisfactory, approve them and recommend their use.
7. Prepare a report on the Project."

Second priority - items not of primary importance in reaching Project goals

- "1. Detailed odor studies based on the Phase I findings will be made in cooperation with industries and agencies. Since standardized practices are not available for this activity, considerable flexibility is needed; however, the following policies and guidelines are presented:
 - a. Emphasis will be placed on development of an odor surveillance network.
 - b. Studies of specific problems will be based on Phase I studies and the priorities which are indicated.
 - c. Odor studies will be made with the cooperation and active participation of potential odor source owners.
 - d. Research agencies and groups will be encouraged to play a part.
 - e. Odor studies will be made with the active participation of the responsible regulatory agency.
 - f. The ultimate objective is to develop and establish an odor control program as part of an air resource management program, primarily, by defining, studying, and solving problems on a priority basis.
2. Continue development of a continuing vegetation damage surveillance activity utilizing local resources. This will be done under the guidance of the Public Health Service, Division of Air Pollution, Laboratory of Medical and Biological Sciences, Agricultural Section, in cooperation with state and local agencies.
3. Encourage the development of an air pollution potential forecasting activity patterned after the Public Health Service program but designed to fit the needs of the project area.

This activity would be developed through the U. S. Weather Bureau primarily by the Weather Bureau Research Station attached to the Public Health Service. It would be dependent in part upon funds and personnel not planned or budgeted for as yet.
4. Consider an industry management opinion survey directed toward finding areas of agreement on air pollution programs and means of implementing an air resource management program.

5. Continue the activities of the subcommittee on education and information developing an adequate and suitable education and information activity. The immediate activity would be the preparation of one or more short publications covering the findings and activities of the Phase I operations. Its second major objective would be the carrying out of an education and information activity starting about March 1, 1964, with the objective of assuring responsible understanding of the findings made during Phase I of the Project and activities being carried on during Phase II.
6. Assist in the evaluation and/or solution of specific air pollution problems in cooperation with industry and regulatory agencies. During activities associated with these problems, assist in the development of ambient air quality standards and pollutant emission standards suitable for the area and encourage regulatory and planning agencies to use the information obtained.
7. Analyze the potential impact of air pollution on the future of central areas of cities in the project area. The completion of this activity will be dependent on the active participation of Downtown St. Louis, Inc., planning commissions, and others having an interest in the future of central city areas."

Third priority - items that are primarily research and are not dependent on action of the local cooperating agencies for successful completion

- "1. Continue to provide the project framework and relationship with various segments of the community to assist with epidemiological, materials deterioration, and other studies as appropriate and as agreed to by the Project Executive Committee.
2. Continue, as provided for in the Phase I Project Agreement, fluorescent particle diffusion studies directed toward determining airflow characteristics over the urban area.
3. Test mathematical diffusion models. This activity, as planned and in operation, provides for the operation of twenty sulfur dioxide sampling stations during December, January, and February 1963 and 1964. A detailed sulfur dioxide emission inventory will be made during the summer of 1964 and additional sulfur dioxide measurements will be made during the winter season of 1964-65."

OBJECTIVES OF INTERSTATE AIR POLLUTION STUDY REPORT

The objectives of the report, in its several parts, are to present the findings of the Study and to recommend an air resource management program plan for the consideration of the people in the St. Louis - East St. Louis Metropolitan Area.

AIR POLLUTION LAWS, ORDINANCES, AND CONTROL PROGRAMS

This report section discusses relevant state and local legislation and programs in each state, including laws for interstate action. A summary of law and ordinance provisions is in Table 2. Their geographic coverage is shown on Figure 2. Enabling legislation is reported only where it has a direct application to air pollution control.

Illinois

State - The State in 1963 enacted the Illinois Air Pollution Control Act. Administratively, the Act creates the Illinois Air Pollution Control Board as an independent agency, with technical and staff services provided by the State Department of Public Health. The Board is empowered to promulgate rules and regulations for prevention and abatement of air pollution and to enforce them in all areas of the State by injunction. The Board, however, may exempt from its enforcement authority local political subdivisions that enforce local ordinances consistent with State requirements. The law also provides that, as a matter of policy, the Board is to encourage authorized air pollution agencies of political subdivisions to handle their respective problems to the greatest extent possible and provide technical assistance to those subdivisions requesting it. The Board is also designated to represent Illinois in negotiations for interstate compacts dealing with air pollution.

Another Illinois statute affecting the St. Clair - Madison County portion of the metropolitan area is the Southwestern Illinois Metropolitan Area Planning Act. This Act creates the Southwestern Illinois Metropolitan Area Planning Commission and charges it with the establishment and adoption of a comprehensive area development plan concerning physical facilities and governmental services. The Commission is to advise units of government of the relationship of local plans to other plans and policies applicable to the area. Although the Act does not specifically or expressly direct the Commission to develop plans relating to air pollution, the broad scope of the Commission's advisory responsibilities and the decisions arising out of the planning process will influence air pollution levels in a major manner. Under the Act, the Commission is also authorized to cooperate with planning agencies in the Missouri area contiguous to the St. Clair and Madison County area. This provision leaves room for the possibility of agreements on planning matters between the Illinois Agency and Missouri counterparts of the Metropolitan area. (See Planning - Organizational Patterns and Trends.)

The Commission has been assembling a staff and starting planning activities. Although the staff has been aware of all parts of the Study and has participated in some activities, the Commission has not as yet established its role in the air pollution field.

Table 2. LAW AND ORDINANCE REFERENCE - AIR POLLUTION CONTROL OR RELATED PROVISIONS IN INTERSTATE AIR POLLUTION STUDY AREA

Place	Air pollution		Weed cutting		Trash burning		Animal keeping		Nuisance control		Zoning	
	Statute or ordinance no.	Year	Statute or ordinance no.	Year	Statute or ordinance no.	Year	Statute or ordinance no.	Year	Statute or ordinance no.	Year	Statute or ordinance no.	Year
Illinois ^a	Air Pollution Control Act Chapter 24 Sec. 11-19-11	1961	Chapter 24 Chapter 34 Sec. 420				Chapter 8		Chapter 100-1/2 Chapter 24 Art. 11 Par. 60.2			
Madison County											Zoning Ordinance (under revision)	1963
St. Clair County												
Monroe County											Rules and procedure on plats and subdivisions	1963
East Side Health District			Chapter 60 Sec. 13				Chapter 54 Chapter 57		Chapter 57 Sec. 2 Chapter 60 Sec. 1-16 Chapter 28 Chapter 58 Sec. 29			
East St. Louis	Ordinance 3916								Ordinance 3916 Sec. 11.1		Zoning Ordinance Page 31	
Granite City ^c	Ordinance 1304		City Code Section 27-401		Section 7 (H)(4)(b)		City Code Sections 17, 1101; 21, 101		Ordinance 1195	1944	Zoning Ordinance No. 1755, Page 10	
Alton			Ordinance 3232	1964	Ordinance 2693	1957			Boynton's Municipal Code	1917	Map available	
Wood River ^d			Chapter 6 Art. 5		Chapter 6 Art. 2		Chapter 8 Art. 10 Chapter 7 Art. 2 Chapter 9 Art. 3		Chapter 6 Art. 7			
Missouri	Senate Bill 112	1965										
St. Louis County	Ordinance 3343	1964	Ordinance 3473				Ordinance 3283		Chapter 602.050		Ordinance 3552	
St. Charles County											Zoning Order and rules for land subdivisions Pages 22, 28, and 29	
Jefferson County											Subdivision regulations	
City of St. Louis ^e	385, 386 387, 647		245		281.100 Ordinance 48173	1957	510-519		386, 535 536		900-919 Ordinance 52132	
University City	Chapter 27				Ordinance 4042	1964						
Manchester					Ordinance 64-181	1964						
Maplewood					Ordinance 3554							
Olivette	Ordinance 703				Chapter 170 Art. 1							
Richmond Heights	Smoke Control											
Webster Groves					Chapter 31.010 (f)							
Clayton	Chapter 6 Art. 5	1965									Ordinance 1823	
Kirkwood					Open burning prohibited							
Normandy					Open burning prohibited							

^a Illinois Revised Statutes 1961 unless otherwise indicated.

^b East St. Louis Ordinances which are enforced by the East Side Health District.

^c References to city code unless otherwise indicated.

^d Wood River City Code 1960.

^e Numbers refer to chapter of the Revised Code City of St. Louis unless otherwise indicated.

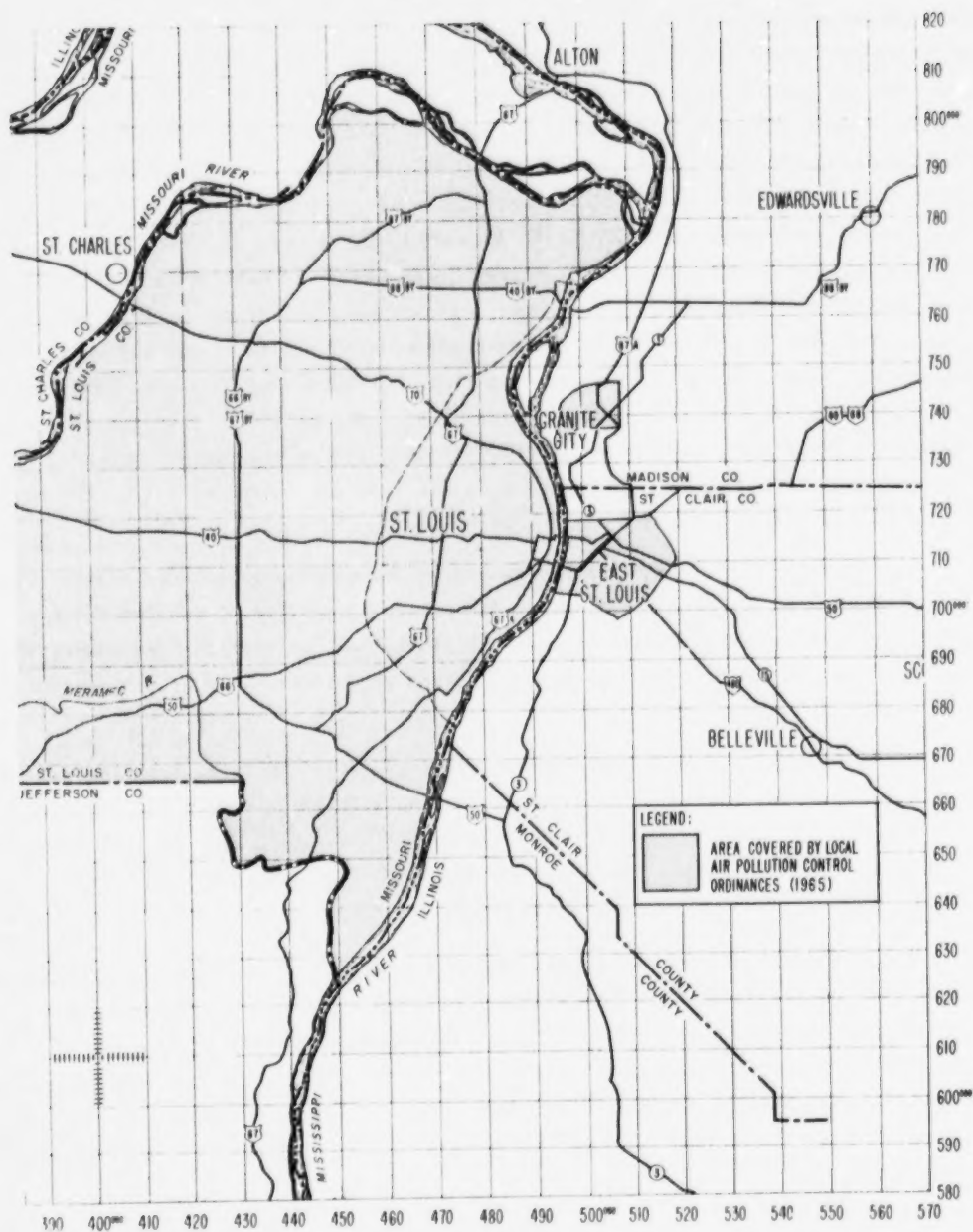


Figure 2. Air pollution control ordinance coverage.

An additional Illinois law relating to air pollution is the State public nuisance law (I.R.S. 1961, Chapter 100½, Sec. 26 (8)), which prohibits, among other things, discharges from manufacturing establishments that are injurious to the health of individuals or the public. Such nuisance laws, whether state or local, are subject to at least two shortcomings in dealing with air pollution problems. Since the application of such laws involves proof of health hazard in a court of law, they have been found to be quite ineffective in controlling air pollution to levels desired by affected populations. This is especially true in complex urban areas where a multiplicity of sources contribute to general community air pollution levels and proof of a specific hazard from any particular source is almost impossible. Furthermore, the basic approach is punitive rather than preventive. For this reason it is not a very constructive part of an air resource management program. Where the penalty is a fine, air polluters in some cases take their chances on escaping enforcement action. Where the penalty involves discontinuance of operations, the law is unlikely to be enforced because of the severity of the penalty. In Illinois, the public nuisance laws are enforced by the county state's attorney rather than the state agency, the Department of Health.

The Department of Health has had authority for many years to make examinations in any locality of the State and maintain laboratory facilities to examine the atmosphere for evaluation of health hazards. Illinois law further provides county and township Boards of Health with powers to make regulations necessary or expedient for the promotion of health.

In 1961 Illinois enacted preventive-type legislation enabling counties and municipalities to regulate and abate operations, activities, and uses of land, buildings, and equipment causing air pollution. No local ordinances in the Study area enacted pursuant to this law have been found. Ordinances in the area appear to all be based on other powers of municipalities.

The Illinois Department of Public Health's Division of Sanitary Engineering and the Illinois Air Pollution Control Board have members on the Interstate Air Pollution Study Executive Committee. The first regulatory action of the Board in the Study area was the promulgation and enforcement of a regulation against the open burning of solid wastes. Plans are under way (January 1966), and one man has been hired to establish a state regional office in the Illinois part of the Study area.

Local - East St. Louis and Granite City in Illinois have ordinances relating to air pollution. Ordinance 3916 of East St. Louis, enacted February 5, 1964, prohibits the production and emission of smoke darker than Number 2 of the Ringelmann Smoke

Chart, regulates the production and emission of flyash and other solid particulate matter from fuel-burning equipment in excess of 0.85 pound per 1,000 pounds of flue gas, (equivalent to 0.245 grain per cubic foot at 500° F), and prohibits hand-firing of fuel-burning equipment, 5 years after the date of enactment, in buildings housing three families or more. It prohibits open burning, makes provision for the measurement and control of air pollutants, makes provision for establishing an air pollution board, and authorizes an installation permit system. East St. Louis also has a zoning ordinance that provides for permitted uses in certain districts according to performance standards. Manufacturing uses are permitted in the specified use district, with the provision that there not be any dangerous, injurious, noxious, or otherwise objectionable noise, vibration, smoke, dust, or other form of air pollution (Article 6, Section 12a of the ordinance). Among the stated purposes of this ordinance are the establishment of a land-use plan and the promotion and protection of public health and safety. In addition to the East St. Louis air pollution ordinance, the East Side Health district enforces certain ordinances in East St. Louis. Some of these relate to air pollution. Chapter 28 requires factories and warehouses using machinery or emitting offensive or noxious fumes, odors or noises to be approved by the Commission of Health. Chapter 58, Section 29 declares offensive and prohibits smells caused by rendering animals or animal scraps except in the stockyard district. The Granite City air pollution ordinance, adopted by the Granite City Council in 1965 provides for the prevention, abatement, and control of air pollution within the city and to a distance of 1 mile beyond the municipal limits. This ordinance prohibits smoke darker than Number 2 Ringelmann and flyash exceeding 0.65 pound per 1,000 pounds of gas. It exempts metal-working industries. It does not cover odors or toxic substances.

In addition to these specific air pollution ordinances, there are ordinances in other towns that regulate open burning, weed cutting, keeping of livestock, garbage storage, and many other items. All relate to air pollution control to some degree. Because of the indirect nature of their application to air pollution control their provisions are not included here. Table 2 summarizes them. Figure 2 shows the area covered by air pollution control ordinances.

In the Illinois part of the Study area in 1965, there were no employees of a local governmental agency working full time on air pollution control. One man was employed, however, from 1963 to 1965 by East St. Louis to assist with the Study and do control activities. The City of East St. Louis plans to hire another man, or in some way make further contribution to the control of air pollution in that area. Granite City has devoted a considerable portion of the time of one man to air pollution activities; his work is limited primarily to complaint investigation and cooperation with air quality measurement activities. Other local governmental agencies in

the Illinois part of the Study area are estimated to devote the equivalent time of one man to air pollution activities. The time of the one-man-equivalent would be composed of incidental work carried on by building inspection staffs, sanitation inspectors, inspectors working with housing authorities, and air quality-measurement-network cooperators.

The East Side Health District, covering the townships of Centreville, Stites, East St. Louis, and Canteen, has participated in the Study and has, in connection with other environmental health work, carried on air pollution control activities for many years. The District is governed by a Board of Directors, which is composed of representatives from the four townships. In most instances the township supervisor serves as the representative. The Board of Directors sets policy for the District. It is thought that if the Health District were to include a complete air resource management program among its functions, a referendum would be necessary to obtain authority and adequate funding. The District has five departments, medicine, dentistry, nursing, sanitation, and administration. The sanitation department is presently (January 1966) operating a Public Health Service, National Air Sampling Network (NASN) air sampler in East St. Louis, but is not sufficiently funded for any additional air resource management activity. The District depends entirely upon tax revenue for its local funds and would probably need an increase in the tax limit to pay for any major increased activity.

The East Side Service and Sanitary District has a seven-man Board of Directors and is supported by tax revenue. It is responsible mainly for the disposition of sewage and storm water.

Missouri

State- In 1965, the State enacted the Missouri Air Conservation Law. It created the Air Conservation Commission of the State of Missouri, a seven-member commission with six members appointed directly by the governor. The seventh member is the Director of the Missouri Division of Health. The Commission, "domociled" in the Division of Health, has authority to hire an executive secretary, adopt rules and regulations, establish emission and ambient air quality standards, grant exemptions to local air pollution control programs, and take action to assure enforcement of its decisions. The Commission is assigned a number of leadership activities, is responsible for issuance of variances and certificates of exemption, and is authorized to represent the State in interstate air pollution matters including negotiation of compacts and agreements. The Commission had not employed a staff as of January 1, 1966.

Most Missouri state air pollution legislation, until the enactment of the 1965 law, consisted of grants of authority to cities and counties of the first and second class to suppress nuisances and abate smoke by ordinances consistent with

state laws. Cities so authorized also have had authority to have health departments empowered to abate nuisances injurious to health. St. Louis County and St. Louis City are chartered and do not fall in the same category as cities and counties that are designated by class. The St. Louis County Department of Health is authorized to enforce the state laws. In this respect the County Health Director is a Deputy State Health Director. Another state statute (Vernon's annotated Missouri Statutes, Section 564.050 and 564.070) provides for smoke abatement near state buildings. To avoid any misinterpretation of the legislative intent of this law, this provision expressly declares that it does not repeal laws giving cities power to abate smoke nuisances; therefore, as in Illinois, the Missouri state law on nuisances provides primarily for local abatement of nuisance conditions by local ordinance or action by local authorities, local health departments, or others. Local exercise of this authority could take the form of zoning laws, nuisance control ordinances, or smoke and air pollution abatement ordinances.

Local- There has been considerable variation in the extent, scope, and nature of local laws dealing with air pollution in St. Louis County and City. This is being changed gradually in St. Louis County as a result of the county-wide authority given to the County Health Department in September 1964 by Ordinance 3347. This Ordinance applies to the entire county, including incorporated areas.

Contracts between the St. Louis County Health Department and county cities are on a voluntary basis for some health services, but air pollution control is not voluntary. The air pollution ordinance applies to the entire county, and supercedes any ordinances cities have that are less stringent than the county law.

The St. Louis County Health Department services almost all the county on the following items: water supply, rabies and pest control, restaurant inspection, and general sanitation service. The Department also provides, by contract, certain services to the Metropolitan Sewer District and serves that part of the county not covered by the District.

St. Louis County Ordinance 3347 prohibits dense smoke (Number 2 Ringelmann or greater), limits flyash to 0.85 pound per 1,000 pounds of flue gases, and prohibits public nuisances. The ordinance establishes the program in the County Department of Public Health; provides for the formation of an advisory board, which is also an appeals board; provides for adoption of rules and regulations; and requires review of plans as a condition for permit issuance by the Department of Public Works of the County, a procedure which has been in operation since 1964. The Director of Environmental Health for St. Louis County enforces the Air Pollution Ordinance through the St. Louis County counselors who act for the Director of Environmental Health.

St. Louis County Ordinance 3352 - 1965 is a zoning ordinance that repeats the principal provisions of Ordinance 3347 and adds sections on vibration, noise, radiation, glare, and heat. These are under a performance standard section of the ordinance.

St. Louis County Ordinance 3347 does not invalidate ordinances adopted by cities in the county. Such ordinances, however, must conform to the provisions of the county ordinance. There are ordinances in the following St. Louis County cities: University City, Manchester, Maplewood, Webster Groves, Clayton, Kirkwood, Normandy, Olivette, and Richmond Heights. The Olivette ordinance is the same as the county ordinance in all essential respects, and indicates that a contract is anticipated with the county for enforcement. The others are primarily smoke-control ordinances. University City permits Number 2 Ringelmann smoke, a provision less restrictive than that of the county ordinance. The Richmond Heights ordinance is preempted by the county ordinance.

In Missouri, St. Louis City, St. Louis County, and University City are the only political subdivisions that have air pollution control programs formally organized and established by ordinance.

The St. Louis City air pollution chapter of the Revised City Code (Ordinance 50163 of 1961) establishes the Division of Air Pollution Control, prohibits the emission of dense smoke defined as Number 2 or greater on the Ringelmann chart except that during the cleaning of the firebox or building a new fire, smoke in excess of Number 2 may be emitted but may not exceed 6 minutes in any hour or be greater than No. 2 Ringelmann for 9 minutes in any hour. The ordinance prohibits the emission of flyash from the burning of fuel in excess of 0.85 pound per 1,000 pounds of flue gases, but not to exceed 0.5 pound per 1,000 pounds of such size particles as to be retained on a 325-mesh sieve. These conditions are to be met when the fuel-burning device is operating at a full load with not more than 50 percent excess air. The ordinance prohibits the use of high volatile coal (in excess of 23 percent volatile matter) except in sizes less than 2 inches in mechanical equipment. If such fuel contains more than 12 percent ash or 2 percent sulfur on a dry basis as mined, it must be cleaned by a washing process so that the ash content is reduced to not more than 12 percent on a dry basis. For hand-firing purposes only, smokeless solid fuel, defined as having a volatile content less than 23 percent, may be used. A companion ordinance provides for the licensing of fuel dealers, the bonding of such dealers to insure their compliance with the restrictions on type of fuel delivered by them, and the placing of stickers on their trucks for identification purposes. With regard to pollutants other than those from combustion sources, the St. Louis ordinances prohibit their emission in such amount or manner as would be detrimental or dangerous to health or cause severe annoyance, discomfort, injury or damage to property to the extent that a public nuisance exists. Other

provisions of the ordinance make it possible to require the testing of any pollutant source, the registration of sources of air pollution, and the submission of detailed data on the nature and amount of emissions.

The St. Louis City Division of Air Pollution Control in 1965 had a director, 11 technician-inspectors, and six clerical workers. The St. Louis County Health Department had a 13-member organization consisting of seven professional, four technical, and two clerical members doing air pollution activities. University City air pollution control activities were contracted to the St. Louis County Health Department in 1965. The city maintains one inspector. The St. Louis City Health Department, although not legally responsible for air pollution activities, devotes the time of one to one-and-one-half men to activities involving sample collection and analysis, and investigation of sanitation problems that relate, at least in part, to air pollution.

Other city and county health agencies in the Missouri area do a certain amount of similar air pollution control work. Table 2 and Figure 2 summarize all known ordinances.

Interstate

Legislation creating the Bi-State Metropolitan District by compact between Missouri and Illinois is the only existing law that provides for interstate action in the Study area. The District includes the City and County of St. Louis and St. Charles and Jefferson Counties in Missouri, and Madison, St. Clair, and Monroe Counties in Illinois. The law provides for the Bi-State Development Agency, which is authorized to construct and maintain certain facilities and to make plans and recommendations to area communities for coordination of matters "in which joint or coordinated action of the communities within the areas will be generally beneficial." Under this broad grant of authority, it would appear that air pollution could come within the Agency's purview, although no specific air pollution authorization is given in the compact.

In 1964, on the initiative of the Mayor of St. Louis, Mayor of East St. Louis, and the Chairman of the Board of Commissioners of St. Louis County, a regional committee was formed. This committee of elected officials appointed a technical committee on air pollution and charged it with the task of preparing a regional air pollution control plan and reporting this plan to the regional committee. It was anticipated that this regional committee would in time become a regional council, with technical committees appointed on many subjects of regional concern.

The Regional Committee held several meetings in which air pollution was discussed and the Technical Committee made some progress in preparing a regional air pollution control plan. Late in 1965 a somewhat different approach to joint action on regional problems appeared possible. This was the establishment of the East-West

Gateway Coordinating Council composed of public officials and state agency members with responsibilities in the transportation field. The membership of the Executive Committee of the Interstate Air Pollution Study includes representatives of several of the major political entities, which are also represented on the East-West Gateway Coordinating Council. If that organization is willing to expand its activities beyond the field of land use and transportation planning, the Executive Committee of the Interstate Air Pollution Study would appear to be a ready-made technical committee that could carry on air pollution functions for the East-West Gateway Coordinating Council.

AIR POLLUTION COMPLAINTS - SURVEY OF RECORDS

Records of 4,584 complaints from local agency files were compiled and summarized. Of these, 3,876 had detailed data regarding type, sources, and effects of air pollution. These records, covering a 5-year period, 1958 through 1962, were from the St. Louis Division of Industrial Hygiene, St. Louis Division of Air Pollution Control, St. Louis County Health Department, and East St. Louis Air Pollution Control Commission. Additional information on complaints was received from 68 other communities in the metropolitan area that responded to the "Municipal Officials' Opinion Survey" on air pollution.

Local Agency Complaint-Handling Systems

As a result of program improvements made by the agencies by 1966, only items pertinent to interpretation of the 1958-1962 data are included here. All agencies surveyed received complaints by letter, telephone, and personal visit. Action taken as a result of the complaints varied greatly, as did the systems of recording and filing the complaint records. Complaint-handling systems were quite well developed in both St. Louis City and County, whereas those in the Illinois part of the Study area were poor to nonexistent. Except for the Illinois part of the Study area, air pollution complaints were linked in some way with complaint-handling systems for health and sanitation programs. The records for the Illinois part of the Study area came from the East St. Louis Air Pollution Control Commission. They are for 1962 only.

Survey Methods

Information found in local agency files was transcribed onto a special form created for this study. A sample is shown in Figure 3. Data extracted from these existing records fall into the following categories:

1. Type of pollution, i.e., smoke, dust, odor, etc.
2. Source of pollution, i.e., industrial, commercial, residential.
3. Effects of pollution, i.e., health, safety, comfort, etc.
4. Dates received.
5. Method received, i.e., telephone, written, or personal visit.

COMPLAINT RECORD		Previous Record	Yes No	NO.
Premises		City	Date Time AM PM	
Nature of Complaint	a) smoke b) soot c) fly ash	d) odor e) dust f) noise		g) fumes h) spray i) other (specify)
Source of Complaint	a) open fire b) waste incineration c) demolition	d) sewage e) streets f) industrial process		g) smoke stack h) vehicle exhaust i) other
Complainant Name, Address, Tel.No.		Rec'd. by Via		
Location of complainant with respect to source:		Direction		
Source determined by		Distance		
Effect	a) eye irritation b) vegetation damage c) reduced visibility	d) soiling e) obnoxious odor f) throat irritation		g) other h) number of people affected
Referred to: (Local Agency)				

Figure 3. Form used to transcribe complaint information from local agency files.

The extracted data were compiled and are presented in tabular form. The percents and numbers will not check exactly because of missing information on some records and multiple entries such as those for effects on others. This, however, does not detract from their value.

Estimates of the numbers of air pollution complaints made to officials of 68 communities were obtained from the Municipal Officials' Opinion Survey made by the Study with the cooperation of the St. Louis County League of Municipalities and the Southwestern Illinois Mayors Association.

Discussion

The number of complaint histories examined are listed by agency in Table 3, and the complaint reports from the Municipal Officials' Opinion Survey appear in Table 4. Table 5 shows the type of pollution complained about. Odor complaints outrank those about smoke, by almost 4 to 1 and all others by more than that. Odor complaints account for 56 percent of the total when the nature of the complaints was specified. Types of sources are presented in Table 6. Industrial sites

Table 3. COMPLAINTS BY AGENCY AND YEAR

Agency*	1958	1959	1960	1961	1962	Total
DIIH ^a	309	235	206	44	37	831
DAPC ^b	545	564	448	640	656	2,853
CHD ^c	520	158	121	-	79	878
ESL ^d	-	-	-	-	21	21
Total	1,374	957	775	684	793	4,583

^a DIIH - St. Louis Division of Industrial Hygiene.

^b DAPC - St. Louis Division of Air Pollution Control.

^c CHD - St. Louis County Health Department.

^d ESL - East St. Louis Air Pollution Control Commission.

Table 4. COMPLAINTS ESTIMATED BY CITY OFFICIALS DURING 1960 AND 1961, OPINION SURVEY

State	Number of communities responding	Complaints
Missouri	49	177
Illinois	19	339
Total	68	516

Table 5. NUMBER OF COMPLAINTS PER TYPE OF POLLUTION - 5-YEAR TOTALS

Agency	Odor	Fumes	Smoke	Dust	Spray	Fly ash	Other ^a
DH	551	173	124	82	10	2	25
DAPC	53	15	37	57	6	16	5
CHD	164	3	32	4	2	0	0
ESL ^b	5	3	6	3	0	0	5
Total	773	194	199	126	18	18	35

^a Includes pollen, chemical gases, mists, and soot.

^b 1 year only, 1962.

Table 6. NUMBER OF COMPLAINTS PER SOURCE OF POLLUTION - 5-YEAR TOTAL

Agency	Industrial	Commercial	Residential	Waste incineration	Sewage	Traffic	Other ^a
DH	500	57	188	17	10	12	50
DAPC	77	6	0	23	0	12	11
CHD	12	1	41	25	20	0	33
ESL ^b	7	3	0	1	0	0	4
Total	596	67	229	66	30	24	148

^a Includes: area complaints, unknown sources, demolition, public buildings, animals, open fires, vehicle exhaust, etc.

^b 1 year only, 1962.

were named most often and residential sources next. Further information was obtained by examining multiple complaints about the same source. In terms of the total, 1,156 complaints were made by 920 complainants about 629 sources. These totals result in ratios of complaints to complainants of 1.3 and of complaints to sources of 1.8. In terms of a single source, in 1958 one industrial site was listed in 122 complaints from 77 complainants. Another industrial site that year was complained about 54 times by seven complainants.

In Table 7, the sources causing complaints (from Table 6) are divided into four categories: industrial, commercial, residential, and miscellaneous. This reveals that the average complaint per source varies greatly, depending on the kind of source. Industrial sources, with 3.7 complaints per source, tend to cause many more complaints, probably because their odorous materials are more intense and readily discernible, and affect wider areas. On the other hand, the local nature

Table 7. RATIO OF COMPLAINTS TO TYPE OF AIR POLLUTION
SOURCE FOR 5-YEAR PERIOD

	Indus- trial	Commer- cial	Residen- tial	Miscella- neous
No. of premises	163	98	282	70
No. of complaints	601	131	344	80
Complaints per type of premises	3.7	1.3	1.3	1.1

of residential sources is shown by the 1.2 complaints per source ratio. The problem resolves itself to one of intensity. Residential sources outnumber industrial, but industrial sources cause more complaints.

The manner in which residents of the metropolitan area are affected by air pollution is reflected in Table 8. One or several effects could be, and often were, listed by one complainant. For example, a complainant might specify smarting of the eyes and a choking sensation due to an odor; or he might complain that smoke was dirtying his property and obstructing clear vision on the highway. Complaints related to health effects represent 12.6 percent, a significant part of the total. Odors again lead with 63 percent, followed by soiling with 21 percent.

A periodicity is noticeable in the seasonal distribution of complaints received by the St. Louis Division of Air Pollution Control. It is shown in Figure 4. June, July, and August were high, and April and May were low. A secondary peak occurred in December and January. The latter can be attributed to the winter heating season. The summer peak was investigated by separating smoke and odor complaints by months. Only St. Louis City data were used. The data are plotted on Figure 5 with average monthly wind speeds. A very definite increase in odor complaints is

Table 8. EFFECTS OF AIR POLLUTION MENTIONED
IN COMPLAINTS - 5-YEAR TOTALS

Agency	Eyes	Nose	Throat	Other ^a health	Obnoxious odor	Soil- ing	Vege- tation damage	Reduced visibil- ity
DIH	8	8	13	129	682	200	3	10
DAPC	3	0	3	3	59	59	0	6
CIID ^b	3	0	2	3	175	34	0	22
ESL ^b	4	0	5	1	10	8	2	6
	18	8	23	136	926	301	5	44
Total number of complaints 1,361.								

^a Includes general ill health, nausea, and headache.

^b 1 year only - 1962.

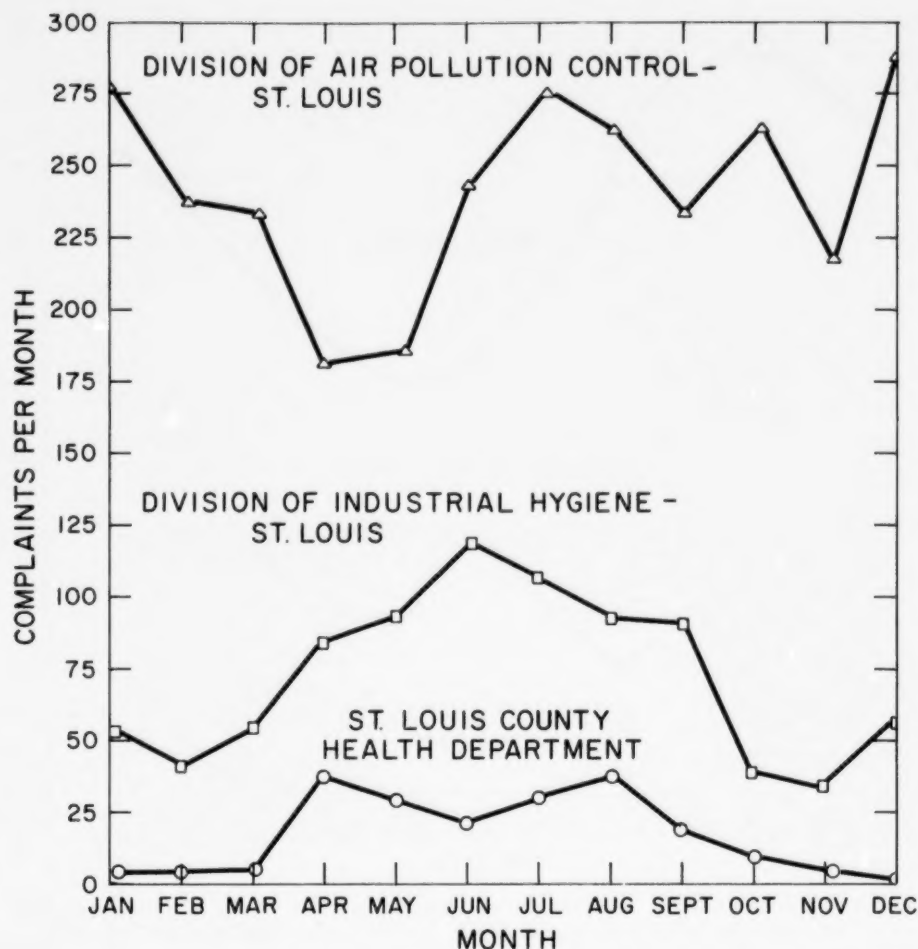


Figure 4. Variation of complaints received per month over a 5-year period.

shown for the summer season and a considerable increase during the period April through September. The relationship with the wind speed curve indicates that increased complaints are related to decreased dilution characteristics of the air mass. This may not be the only influence since people's summertime living habits may give them considerably greater exposure to odors. In any event, an air pollution agency would need to design its odor control program to meet the critical summertime conditions.

Practically all complaints registered at the local agencies were made by telephone. In those cases where specified, records showed that the telephone was used to make 916 complaints, whereas only 84 were made by letter and 15 by personal

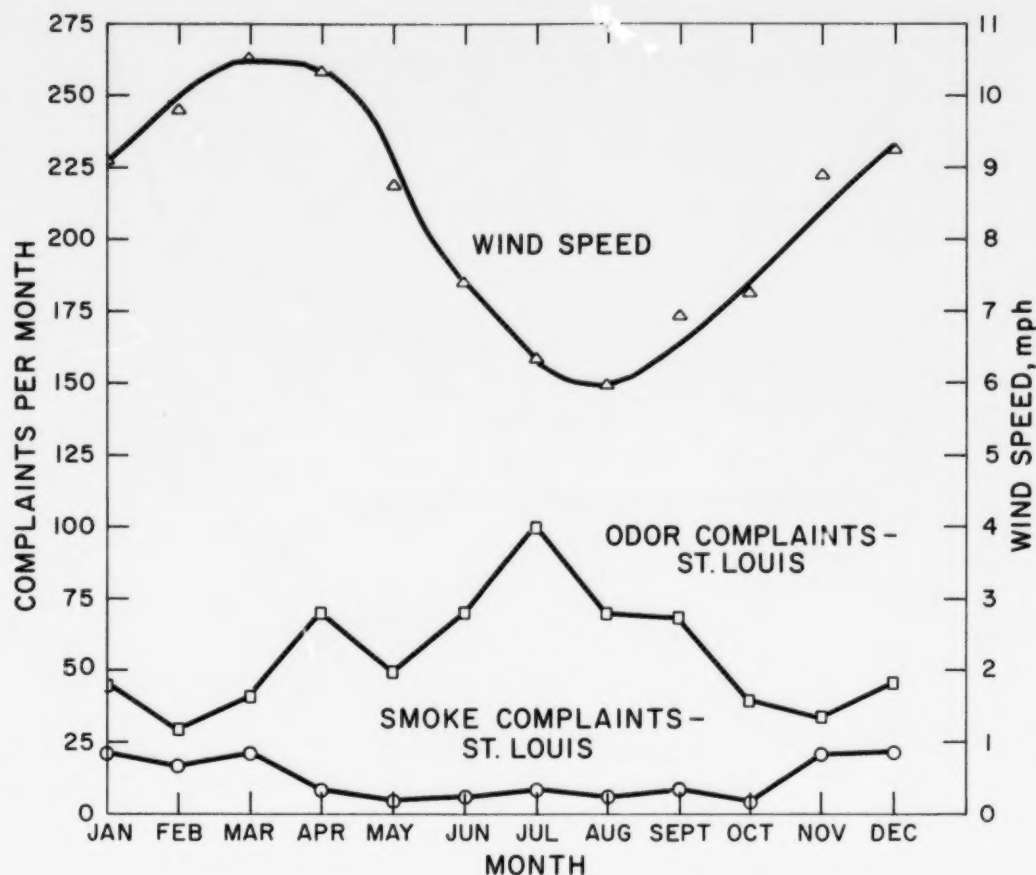


Figure 5. Variation of odor complaints received per month over a 5-year period and monthly average wind speed. Variation of wind speed with season 10-year averages.

visit of the complainant to the agency. This is not particularly surprising. The telephone provides the most convenient means of communication, suits the needs of the transitory nature of air pollution nuisances, and protects the anonymity of the caller, if so desired.

A more efficient means of receiving and recording the complaints would provide statistics of more value to the control officer and of public interest.

Conclusion

Odors are the type of air pollutant most often reported. Industrial sources are most often complained about and effects of odors are reported most often. Complaints peak in July and December. In order to turn citizen complaints into an effective program-orientation and development tool, two steps are necessary. First, public action must be directed by an education program that would inform people

where to send their complaints and how to make them. A vague complaint about "smoke or something located somewhere in the area," is of very little value to the control agency. Second, a system for recording complaints and interpreting complaint records must be placed in operation. It should be uniform and cover the entire air pollution basin. Such a system provides a means for determining program needs and priorities by showing which areas are having the most problems and what kinds of problems are prevalent. Information obtained could aid the agency in many ways, such as deploying its manpower in the field, serving the public better, and showing need for additional monies, manpower, or directed action.

A complaint form, like the one used to record complaints for this report is an indicated need. Use of this form would provide the necessary information to compile data of the kind discussed above, and aid the inspector who must answer the complaint in the field. The form should be designed to record complaints as received by phone at the respective agencies and to facilitate data handling.

PLANNING AND ZONING--LAWS, ORDINANCES, AND PROGRAMS

Planning - Organizational Pattern and Trends

Cities and counties are "creatures of the state." As such, their authority for planning and zoning comes from the states. This delegation of authority is reflected in state laws that treat these subjects specifically as well as those treating "home rule" aspects of state-local relations. The latter are formalized at the local level in city and county ordinances. In Missouri, the type of charter granted to a county further defines planning and zoning authority. Powers for planning and coordination of planning in both Illinois and Missouri are provided for in the authority of the Bi-State Development Agency, the only agency in the Study project area with authority based on action of both state legislatures. Because of lack of financial support from the two states, this planning authority has never been implemented in a continuing sense, although the Agency has participated in the Interstate Air Pollution Study, and since 1950 has carried out several transportation and stream pollution studies for which specific grants were made available.

The State of Illinois in 1963 enacted legislation forming the Southwest Illinois Metropolitan Area Planning Commission. This Agency has activities under way covering Madison and St. Clair Counties.

In summary, in the Study area, planning and zoning are well-developed activities in both St. Louis County and the City of St. Louis, with coordination between the two arranged through administrative channels. Two counties, Madison and St. Clair, are developing a comprehensive program; and three counties, St. Charles, Jefferson, and Monroe, have minor activities in these fields.

In 1963 the Bi-State Development Agency took the initiative in establishing an organization to carry out the continuing comprehensive transportation planning process required by the Federal Aid Highway Act of 1962. This organization, the East-West Gateway Coordinating Council, may furnish the appropriate governmental vehicle by which coordination of all planning activities in the St. Louis Metropolitan Area may be accomplished.

In the six-county Study area in 1964, there were 22 professional members of planning staffs and total staffs of about 46 persons or one professional planner to about 90,000 persons and every 166 square miles. Activities, to a considerable extent, relate to zoning with rather limited resources devoted to studying relationships of land and space uses. Formal coordination of planning activities between agencies is minimal, but is generally recognized as desirable. Activities are becoming coordinated in Madison and St. Clair Counties through the Southwestern Illinois Metropolitan Area Planning Commission. The City of St. Louis and the St. Louis County governments have taken a positive step toward coordination by issuing instructions to their departments, including planning commissions, to cooperate and coordinate activities to the fullest extent possible. Other governmental jurisdictions have not as yet established coordinating procedures, but may be expected to take some action as a result of needs resulting from highway development, sewage treatment, sewerage, refuse disposal, air pollution, other common problems, and the mutual desire for economic development.

Missouri

St. Louis - The City Planning Commission in 1964 had a staff of 22 people, 12 of whom were in professional categories and rated as planners. The Commission itself has nine citizen members appointed by the Mayor and six ex-officio members. They plan for the entire city and carry out required activities such as the development of a master plan and maintenance of official maps. The Commission does not administer zoning regulations; this is a function of another branch of the city government. In case of need, assistance to the Commission is available from the City Division of Air Pollution Control; however, the planning and zoning ordinance does not require such cooperation. This arrangement is in contrast to the Division of Air Pollution Control ordinance, which requires the Commissioner to approve plans before a building permit is issued. Such an arrangement tends to assure good air pollution control devices, but does not incorporate air quality considerations at a planning and community decision-making level.

The Planning Commission program is developed and presented to the Commission by the director, where it is approved or modified. Decisions of the Commission are made on the basis of study-reports, facts presented by the technical staff of

the Commission after study, and thorough examination by both the full committee and subcommittees. This organization, in view of the wide representation on the Commission, provides a good basis for making community decisions, short of taking matters to the electorate. Unfortunately, at the present time air pollution information, including micrometeorology, is not available to the Commission members to assist them in reaching decisions, but could be readily incorporated in the decision-making system.

The data-handling system that the Commission has for land-use information could be readily adapted to the handling of air pollutant emission data because the land-use data are already on automatic data-processing cards. Putting emission information and map-grid data on the same cards should be feasible, and computer programs utilizing mathematical diffusion models could be employed to predict air pollution levels from these emission sources. Other important calculations could also be made, for example, amounts of emissions and the geographic areas from which they originate, and predictions concerning the effects of locating new air pollutant sources.

Decisions that implement a plan are not usually within the scope of the Commission. These decisions rest with the City Council, private interests, and the electorate, primarily because of the funding of projects involved.

St. Louis County - In 1964 the St. Louis County Planning Commission also had a staff of 22 persons; eight were professional people dealing with planning, two were administrative, three were draftsmen, three had activities relating to zoning, one was a student, one was an auxiliary, and four were secretaries. The 9 members of the Commission cannot hold other County offices. They are all appointed by the County Supervisor. The Commission's planning and zoning activities relate to the unincorporated parts of the county. The incorporated area consists of 97 cities of several categories. Sixty-three of these have planning commissions and 24 have none; for ten no information was available. It is understood that, in general, these commissions are primarily interested in zoning, and that the professional planning activities are carried on by contract with private planning firms. There are no professional planners in the full-time employment of any of these cities.

The St. Louis County book of ordinances, under paragraph 1003.163, lists performance standards having to do with (1) vibration, (2) noise, (3) odors, (4) smoke, (Number 2 Ringelmann or higher prohibited), (5) toxic gases, (6) dust, dirt, flyash, and other forms of particulate matter (0.85 lb per 1,000 lb of gas), (7) radiation, and (8) glare and heat. Items 3 to 6 are referenced to the county air pollution control ordinance, number 3347. These are minimum standards which may be surpassed by ordinances or rules and regulations of other agencies of county government. These

standards are not enforced by the Planning Commission, but by the Health Department when air pollution matters are involved and by the Public Works Director, who is the named zoning-enforcement officer for other matters. This is not the only ordinance relating to air pollution in the county (see section on laws). The County Council is the final authority and must approve any master plans, recommendations, or regulations of the Planning Commission. The members of this Commission represent a wide spectrum of interests. With these backgrounds, they are in good positions to study planning matters and make responsible group decisions. Here again, unfortunately, there is a lack of use of air pollution information relating to the county and surrounding area that should be considered and incorporated in the Commission's decisions.

St. Charles County - State law classifies St. Charles as a third-class county; therefore, planning and zoning provisions contained in Sections 64.510 to 64.690 of the Missouri Statutes may be adopted by approval of the electorate. Approval was given by vote on November 2, 1959. A publication, "Zoning Order and Rules for Land Subdivision," was issued at that time. In 1964 the St. Charles County Planning Commission had a staff of three people, none of whom were professional planners. The staff is responsible to the eight-man Board of Commissioners. This Board is composed of men appointed by the court for 4-year staggered terms. In all cases the County Court can overrule the decisions of the Board of Commissioners. The organization described above is responsible for all zoning and planning in the unincorporated areas. Some incorporated areas, such as the City of St. Charles, have their own zoning and planning organizations, but in many cases there are none. To date, the Board of Commissioners has devoted almost 100 percent of its time to zoning. Very little has been done on planning.

Air pollution problems are prevented by the county in two ways. First, any type installation considered to be a major source of air pollution must be placed in a certain area. Second, permission to build such an installation requires additional approval from the County Court. This approval is based on a list of "dirty" industries.

Jefferson County - The residents of Jefferson County voted in 1963 to adopt Sections 64.510 to 64.690 of the Missouri Statutes that cover zoning and planning for class two and three counties. A planning and zoning board of eight men was appointed by the circuit judge to initiate the program. A director of planning and a staff of four were hired. In March 1965, an economic and population report covering three townships was released. In April 1965, subdivision regulations for the county went into effect. The only other planning and zoning activities were in the city of DeSoto. This program dates back to 1959.

Illinois

Southwest Illinois Metropolitan Area Planning Commission - This Commission was formed by an act of the Illinois Legislature in 1963. The Commission's authority covers Madison and St. Clair Counties; Monroe County, therefore, is the only Illinois area in the Interstate Air Pollution Study outside the jurisdiction of this new planning agency. The relationships between this agency and the numerous local governments, special districts, and interests in the area cannot be foreseen, but the representation on the commission, the planning staff being employed, and planning needs of the area would undoubtedly provide a fertile field for productive use of air pollution information leading toward a responsible air resource management program. Furthermore, the interest of Southern Illinois University indicates the probability of far-reaching effects. For the purpose of this report, Southern Illinois University has been considered to have two professional planners dealing with community planning matters.

Madison County - A zoning ordinance administered by Madison County applies to all areas outside of incorporated areas. The County has a planning commission, land-use maps, and ordinances, which are enforced by the County building inspector.

The cities in Madison County have varying degrees of activity in planning and zoning. Alton has a good set of land-use maps, prepared by Harlan Bartholemew and Associates, and zoning and subdivision regulation. Alton has used the city's extraterritorial powers to protect the city boundaries. No professional planners are on the city staff. Granite City also has a land-use map, prepared by Harlan Bartholemew and Associates. This group also prepared a city plan in 1956, which has subsequently been updated. The City has subdivision regulation and zoning, which are enforced by the building inspector. Like all other cities in the County, no professional planning staff is employed by Granite City. Collinsville has a limited type of subdivision control and has had a Federal Housing and Home Financing Agency funded planning program, from which came a three-volume report. East Alton does not have any planning or zoning ordinances. Edwardsville has subdivision regulation and a new ordinance to be adopted. A Housing and Home Financing Agency planning study has been made for Edwardsville by a private planning consultant. Wood River has an ordinance and subdivision regulation. They are administered by the City Manager. Roxana has a planning commission.

St. Clair County - This County instituted subdivision control in 1963 for all unincorporated areas. No organized continuous planning is done by the County. East St. Louis has a zoning ordinance and a plan, which was prepared in 1958-59. Neighborhood planning has been done in several areas of the city. The Housing Authority, which is legally independent, also does some planning in connection with the normal housing program and a new program that provides housing for the elderly. This

program is not limited to East St. Louis, but may be undertaken in other areas. As such, it may provide important planning services. In Belleville, a proposed ordinance relating to zoning and planning was defeated twice during 1963.

Monroe County - This County, which is less developed than the other Illinois counties in the Study area, in 1965 reported zoning to be under study and plans being developed by a St. Louis firm.

FUTURE PLANNING ORGANIZATIONAL PATTERN CONSIDERATIONS

A number of community development considerations, as well as problems such as water pollution and air pollution, call for contemplation of a larger area than that encompassed by any of the existing planning agencies or other agencies of local government. The organizational approach toward meeting this need could take many courses. The following needs are important in relation to the planning and zoning aspects of air resource management:

1. A need for complete planning coverage of the air pollution basin. This could be by one or several planning agencies, but would need to have built-in features to assure coordination and uniformity of action on those items requiring such action.
2. A need for air resource management facts on which to base sound planning and zoning decisions. These should relate to all aspects of the sources, transport, and receptors of air pollution, but in particular, should cover in a geographic manner:
 - a. Actual levels of air pollution and data from an air quality monitoring system to establish air quality trends.
 - b. Emissions of air pollutants by various types of industrial, commercial, and residential areas all related quantitatively to unit areas.
 - c. Emission factors for different types of industrial, private, and public operations.
 - d. Air-quality standards. This will call for a decision-making organization, suitable for establishing standards and changing them as new facts and considerations become available.
 - e. Emission standards established to meet air quality standards or goals.
 - f. A monitoring program reporting effects of air pollution on humans, animals, vegetation, and materials.
3. A need for a method of predicting the effect of planning decisions on air quality levels.
4. A need for additional and continuing information concerning micrometeorology.

5. A need for a map grid system adopted and used by all agencies and groups involved with air pollution and planning.
6. A need for a data bank covering the metropolitan area.

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